Quantitative Aptitude

Introduction

I have created tutorials on various topics of quantitative aptitude which contain basic formulas on those topics and ways to solve tricky problems easily.

These formulas and tricks have been created by me after years of practice and cracking numerous interviews and competitive exams.

The tricks and formulas shared here will be helpful in banking exams, insurance exams, company recruitment, railways exams and other competitive exams.

Let us look at some of the important topics of quant.

Note :- You can also buy a course where I have explained each PDF topic in detail at – Click Here

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Simple Interest and Compound Interest

SI = $\frac{P*R*T}{100}$

CI = P $\left(1-\left(1+\frac{R}{n}\right)^{nT}\right)$

where,

CI = Compound Interest

SI = Simple Interest

R = Interest Rate

P = Principle

T = Time

n = number of times in a year the interest gets compounded

1. Difference between Simple Interest and Compound Interest : -
   a. **One year difference** –

      CI - SI = 0

   b. Two year difference –

      CI - SI = $P(\frac{R}{100})^2$

   c. Three year difference –

      CI - SI = $P\left(\frac{R}{100}\right)^2\left(\frac{300+R}{100}\right)$

   d. When time = 0 or time = 1, then difference between CI and SI would be 0.
2. If principle is doubled in T years and R rate then value of SI/CI would be same as principle.
   a. **Example** :-

i. **Question** :- If principle = 100 and it becomes 200 in 5 years at 20% interest rate, then find Simple Interest ?
Answer :- Since we can see principle has doubled from 100 to 200, so we do not need to calculate SI using formula, it would simply be same as principle i.e 100.

Common Fractions and Decimal Conversions

$\frac{1}{2}$ = 0.5

$\frac{1}{3}$ = 0.33

$\frac{1}{6}$ = 0.166

$\frac{1}{8}$ = 0.125

$\frac{3}{4}$ = 0.75

$\frac{1}{11}$ = 0.0909

$\frac{3}{8}$ = 0.375

$\frac{1}{4}$ = 0.25

$\frac{1}{5}$ = 0.2

$\frac{1}{9}$ = 0.111

$\frac{1}{7}$ = 0.1428

$\frac{5}{6}$ = 0.833

$\frac{7}{8}$ = 0.875

$\frac{5}{7}$ = 0.7142

Useful Observation:--

$\frac{1}{9}$ = 0.111…

$\frac{2}{9}$ = 0.222...

$\frac{3}{9}$ = 0.333…

$\frac{4}{9}$ = 0.444…

.

.

$\frac{7}{9}$ = 0.777…

$\frac{8}{9}$ = 0.888…

You can observe in above case, when the denominator is 9 then we get the numerator after decimal as its result.

Rank in Class and Standing in Queue

1. The rank of a student from top is **n** and total students in class are **x**, then the rank of student from bottom = **(x-n+1)**
    a. This formula can be used in reverse also like – if the rank is given from top and bottom and now total number of students in class are asked then –

        (x-n+1) = m (where m is rank from bottom)

        x = m+n-1

    b. Number of students between two ranks from top :-

        Let rank of stu1 from top = 10

        Let rank of stu2 from top = 36

        Number of students between stu1 and stu2 = 36 – 10 – 1 = 25

Note :- The above formulas apply for queue/line questions.

Tricks on Ratio

Question Type 1 :- If, A:B = 3:5 and B:C = 4:1, then find A:B:C

Solution :- We observe here that B is common both ratios. So we must try to make the value of B same in both ratios. To do that we multiple the value of B in one ratio with the value of B in other ratio i.e we multiply 3:5 by 4 and multiply 4:1 by 5.

⇨ (A:B) * 4 = (3:5) * 4 = 12:20

(B:C) * 5 = (4:1) * 5 = 20:5

⇨ A:B = 12:20

B:C = 20:5

Now we have value of B common in both ratios hence we can now combine them :-

⇨ A:B:C = 12:20:5

Question Type 2 - Many times we may need to convert fractional ratio such as $\frac{2}{3}:\frac{3}{4}:\frac{4}{5}$ into non–fractional ratio.

Solution :- In such type of questions we simply need to find the **LCM** of the denominators of the and multiply it with the ratio.

In our case Denominator(3,4,5) = 60

$(\frac{2}{3}:\frac{3}{4}:\frac{4}{5})$ * 60 = 40:45:48

Speed, Distance and Time

- Basic Formula :-

  S = $\frac{D}{T}$

  Where ,

  S = Speed, D = Distance covered, T = Time taken

- **Average Speed =** $\frac{(2*S1*S2)}{(S1+S2)}$

  Where,

  S1 = First speed , S2 = Second speed

  Question Example :- If a car goes from point A to B at a speed of 10 km/hr and returns from point B to A at a speed of 20 km/hr, then find average speed of car during the journey ??

  Solution :- Let S1 = 10 km/hr, S2 = 20 km/hr

  Average speed = $\frac{(2*10*20)}{(10+20)}$ = 13.33 km/hr

- **Convert km/hr -> m/s multiple the value by 5/18**
  - Example :- 18 km/hr = 18 * 5/18 = 5 m/s
- **Convert m/s -> km/hr multiply the value by 18/5**
  - Example :- 10 m/s = 10 *18/5 = 36 km/hr

Important Square of Numbers

$1^2 = 1$	$11^2 = 121$	$21^2 = 441$	$31^2 = 961$
$2^2 = 4$	$12^2 = 144$	$22^2 = 484$	$35^2 = 1225$
$3^2 = 9$	$13^2 = 169$	$23^2 = 529$	
$4^2 = 16$	$14^2 = 196$	$24^2 = 576$	
$5^2 = 25$	$15^2 = 225$	$25^2 = 625$	
$6^2 = 36$	$16^2 = 256$	$26^2 = 676$	
$7^2 = 49$	$17^2 = 289$	$27^2 = 729$	
$8^2 = 64$	$18^2 = 324$	$28^2 = 784$	
$9^2 = 81$	$19^2 = 361$	$29^2 = 841$	
$10^2 = 100$	$20^2 = 400$	$30^2 = 900$	

Important Cube of Numbers

$1^3 = 1$

$2^3 = 8$

$3^3 = 27$

$4^3 = 64$

$5^3 = 125$

$6^3 = 216$

$7^3 = 343$

$8^3 = 512$

$9^3 = 729$

$10^3 = 1000$

$11^3 = 1221$

$12^3 = 1728$

$15^3 = 3375$

Time and Work

Basic Formulas :-

1. If work is completed by a man in 30 days then work done by a man in 1 day is $\frac{1}{30}$. Similarly if 1 day work of man is $\frac{1}{40}$ then time taken to complete work will be 40 days. (We just need to reciprocate the value)
2. If work is completed by 20 men in 30 days then work done by 20 men in 1 day is $\frac{1}{30}$
3. If work is completed by 20 men in 30 days then work done by 1 man in 1 day is $\frac{1}{(30*20)}$

Question Type 1 :- Work is done by 1 man in 10 days. In how many days work will be completed by 5 men ?

Solution :- Work done by 1 man in 10 days

1 day work of 1 man = $\frac{1}{10}$

1 day work of 5 men = $(\frac{1}{10})*5 = \frac{1}{2}$

Work completed by 5 men in 2 days

Question Type 2 :- If 4 men complete work in 10 days. In how many 1 man will complete the same work?

Solution :- Let 1 man takes M days to complete work.

So 1 day work of 1 man = $\frac{1}{M}$ (Observe basic formulas point 1)

Now 1 day work of 4 men = $(\frac{1}{M})*4 = \frac{4}{M}$

Hence time taken to complete the work by 4 men = $\frac{M}{4}$ (Observe basic formulas point 1)

$\frac{M}{4}$ = 10

M = 40

Question Type 3 :- 4 men and 3 women can complete work in 6 days. 2 men and 5 women complete work in 8 days. How many days a women take alone to complete work ?

Solution :- Let 1 woman takes W days to complete work and 1 man takes M days to complete work.

1 day work of 1 woman = $\frac{1}{W}$ 1 day work of 1 man = $\frac{1}{M}$

1 day work of 3 women = 3*($\frac{1}{W}$) = $\frac{3}{W}$

1 day work of 4 men = 4*($\frac{1}{M}$) = $\frac{4}{M}$

1 day work of 4 men and 3 women = $\frac{1}{6}$

Hence, $\left(\frac{4}{M}\right)$ + ($\frac{3}{W}$) = $\frac{1}{6}$ => $\frac{2}{M}$ = ($\frac{1}{12}$) – ($\frac{3}{2W}$)

Similarly, ($\frac{2}{M}$) + ($\frac{5}{W}$) = $\frac{1}{8}$

($\frac{1}{12}$) – ($\frac{3}{2W}$) + ($\frac{5}{W}$) = ($\frac{1}{8}$)

$\frac{1}{W}$ = $\frac{1}{84}$

W = 84

Question Type 4 :- A completes work in 8 days, B completes work in 10 days. In how many days they complete work if they work alternate days starting with B.

Solution : - 1 day work of A = $\frac{1}{8}$ 1 day work of B = $\frac{1}{10}$

1 day work by A and B together = $\left(\frac{1}{8}\right)$+ $\left(\frac{1}{10}\right)$ = $\frac{18}{80}$ = $\frac{9}{40}$

Since, the work alternate days, so A and B together 2 days work = $\left(\frac{9}{40}\right)$

BA = $\left(\frac{9}{40}\right)$

Now multiply $\left(\frac{9}{40}\right)$ with such number so that the fraction remains less than 1.

Multiply $\left(\frac{9}{40}\right)$ by 4 = $\left(\frac{36}{40}\right)$ = $\left(\frac{9}{10}\right)$

Since we multiply it by 4, this means BA works in combination 4 times to achieve $\frac{9}{10}$ of the work. So, they work together for 8 days to do $\frac{9}{10}$ of the work.

Now, work remaining = 1 - $\left(\frac{9}{10}\right)$ = $\frac{1}{10}$

Its B's turn to work now, So B will complete the $\frac{1}{10}$ work in 1 day.

Hence total days taken = 8+1 = 9 days

Now, let us assume A starts the work,

So, AB = $\frac{9}{40}$

Multiply $\left(\frac{9}{40}\right)$ by 4 = $\left(\frac{9}{/0}\right)$ (8 days taken to complete work)

Remaining work = $\left(\frac{1}{10}\right)$

Its A's turn to work now, So

$\frac{1}{8}$ work done by A in = 1 day

$\frac{1}{10}$ work done by A in = $\left(\frac{1}{1/8}\right) * \frac{1}{10}$ = 0.8 day

Hence total days taken = 8+0.8 = 8.8 days.

Efficiency, Work and Time

Points to remember:

1. Efficiency directly proportional to Work done
2. Efficiency inversely proportional to Time taken

Question Type 1 :- A is 30% more efficient than B. If A alone take 23 days to complete a work. Then how many days B would take ?

Solution :- 1 day work of A = $\frac{1}{23}$

Let B take B1 days to complete work.

1 day work of B = $\left(\frac{1}{B1}\right)$

Since "Efficiency directly proportional to Work done", so we will make equation of efficiency based on work done in one day.

Here, A is 30% more efficient that B, so it means A does 1 day work 30% faster than B :-

$$\left(\left(\frac{30}{100}\right) * \left(\frac{1}{B1}\right)\right) + \left(\frac{1}{B1}\right) = \left(\frac{1}{23}\right)$$

$$1.3*\left(\frac{1}{B1}\right) = \left(\frac{1}{23}\right)$$

$$B1 = \frac{299}{10}$$

Question Type 2 :- A can do work in 12 days. B is 120% as efficient as A. Find time taken by B to complete the work ?

Solution:- Work done by A in 1 day = $\frac{1}{12}$

Since "Efficiency directly proportional to Work done", so we will make equation of efficiency based on work done in one day.

B = 1.2 * $\left(\frac{1}{12}\right)$ = $\frac{1}{10}$

B can complete work in 10 days.

Question Type 3 :- Time taken by A and B to complete work alone in ratio is 8:7. Find the ratio of their efficiencies.

Solution :- Ratio of time taken $\frac{A}{B}$ = $\frac{8}{7}$

Since "Efficiency is inversely proportional to time take", hence:-

Ratio of efficiencies $\frac{A}{B}$ = $\frac{7}{8}$

Question Type 4 :- Ratio of efficiency of A and B is 3:4. If A and B together take 60 days to complete the work, then how much time A takes to complete the work alone ?

Solution : - Ratio of efficiency $\frac{A}{B}$ = $\frac{3}{4}$

Since "Efficiency is inversely proportional to time take", hence :-

Ratio of time taken is $\frac{A}{B}$ = $\frac{4}{3}$

Let, A completes work alone in 4x days.

B completes work alone in 3x days.

So, $\left(\frac{1}{4x}\right) + \left(\frac{1}{3x}\right) = \left(\frac{1}{60}\right)$ => x = 35

Hence, A takes 140 days to complete the work alone.

Speed, Distance and Time

S = $\frac{D}{T}$

S = Speed

D = Distance

T = Time

Average speed = $\left(\frac{2*S1*S2}{S1+S2}\right)$

S1 = Speed during first part of journey

S2 = Speed during second part of journey

Conversions:-

Convert km/hr. to m/s multiply the value by $\frac{5}{18}$

Convert m/s to km/hr. multiply the value by $\frac{18}{5}$

Find HCF of 3 numbers

Let us see with an example how to find HCF of 3 numbers quickly:-

Question :- Find HCF of 159,243,306

Solution :- HCF (159,243,306)

HCF(243-159, 306-243)

HCF(84,63)

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Trick to find square root of numbers within seconds

Let us find square root of a number using an example:-

Question 1:- Find square root of 4489

Step 1 :- Ones digit in 4489 is 9. We need to find that 9 comes in the square of which number? It will be 3 and 7.

Step 2 :- Now leave ones and tens digit in 4489 and pick up rest of the digit i.e. 44. We need to see that 44 comes between squares of which two numbers :-

$62 < 44 < 72$

Now choose 6 as your tens digit of the final square root.

Step 3 :- To find the ones digit of square root, we go to step 1. The square root will be either 63 or 67. To choose between the two, we multiply the squared digits obtained for comparison in step 2 i.e 6*7 = 42

Now compare the 42 with the number obtained after leaving ones and tens digits in 4489 i.e. 44.

Since, 44>42, so resultant we choose greater number between 63 and 67. So, square root will be 67.

Question 2:- Find square root of 7056

Step 1 :- Ones digit in 7056 is 6. We need to find that 6 comes in the square of which number? It will be 4 and 6.

Step 2 :- Now leave ones and tens digit in 7056 and pick up rest of the digit i.e. 70. We need to see that 70 comes between squares of which two numbers :-

$82 < 44 < 92$

Now choose 8 as your tens digit of the final square root.

Step 3 :- To find the ones digit of square root, we go to step 1. The square root will be either 84 or 86. To choose between the two, we multiply the squared digits obtained in step 2 i.e 8*9 = 72

Now compare the 70 with the number obtained leaving ones and tens digits i.e. 72

Since, 70>72, so resultant we choose smaller number between 84 and 86. So, square root will be 84.

Profit and Loss

Basic Formulas :-

Profit = SP – CP

Loss = CP –SP

Profit% = ((SP-CP)/CP)*100

Loss% = ((CP - SP)/CP)*100

Where, CP = COST PRICE

SP = SELLING PRICE

1. If Cost price = CP and discount is x%, then

SP = $\left(\frac{(100-x)}{100}\right)$*CP

Example Question:- Cost of a table is 300. If discount is 10% then find the Selling price?

Solution:- Selling Price = ((100-10)/100)*300 = 270

Question Type 1 :- A start business. After 6 months B joined. At the end of the year A and B profit ratio is 1:2. Find the investment ratio.

Solution:- Let investment of A = x

Let investment of B = y

A invests for 12 months while B invests for 6 months, So.

$\left(\frac{12x}{6y}\right) = \frac{1}{2}$

$\frac{x}{y} = \frac{1}{4}$

Mensuration

Cube

- Total Surface Area of cube = 6*$(side)^2$
- Volume of Cube of cube = $(side)^3$

Cylinder

- Curved Surface area of cylinder= $2\pi rh$
- Total Surface area of cylinder= $2\pi rh + 2\pi r^2$
- Volume of cylinder= $\pi r^2 h$

Cone

- $(\text{Slant Height}(l))^2 = r^2 + h^2$
- Curved Surface area of cone = πrl
- Total Surface area of cone = $\pi rl + \pi r^2$
- Volume of cone = $\frac{1}{3}\pi r^2 h$

Sphere

- Surface area of sphere = $4\pi r^2$
- Volume of sphere = $\frac{4}{3}\pi r^3$

Hemisphere

- Surface area of sphere = $2\pi r^2$
- Total surface area of sphere = $3\pi r^2$
- Volume of sphere = $\frac{2}{3}\pi r^3$

Rhombus

- Area of Rhombus = $\frac{1}{2} * (diagonal\ 1) * (diagonal\ 2)$
- Side of Rhombus = $\frac{1}{2} * \sqrt{(diagonal\ 1)^2 + (diagonal\ 2)^2}$

Parallelogram

- Area of parallelogram = $\frac{1}{2} * (base) * (height)$

Important Part 1:-

- Area of Equilateral triangle = $\frac{\sqrt{3}}{4} * (side)^2$
- Area of Hexagon = $\frac{3*\sqrt{3}}{2} * (side)^2$
- Area of pyramid = $\frac{1}{3} * (height) * (area\ of\ base)$ [where "area of base" is the area of equilateral triangle formed a base of pyramid)

Important Part 2:-

- Sum of angles of polygon having n sides = (n-2) * 180°
- Sum of exterior angles of polygon = 360°

THANK YOU

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